

ORIGINAL ARTICLE

Two new species of *flavomaculata*-group of the genus *Macrophya* Dahlbom (Hymenoptera: Tenthredinidae) from China

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Abstract A taxonomic review is provided for the *flavomaculata*-group of the genus *Macrophya*, including the descriptions of two new species from China, namely *M. coloritibialis* Li, Liu & Wei, **sp. nov.** and *M. zhui* Li, Liu & Wei, **sp. nov.** A key to Chinese species of this group is provided. The type specimens of new species are deposited in the Insect Collection of Central South University of Forestry and Technology, Changsha, Hunan, China.

Key words Symphyta, Tenthredininae, *Macrophya*, taxonomy.

1 Introduction

Macrophya Dahlbom, 1835, the third largest genus of the subfamily Tenthredininae (Hymenoptera: Tenthredinidae), contains 275 species worldwide (Li & Wei, 2013; Li *et al.*, 2013a, b, c, 2014a, b, 2016a, b; Liu *et al.*, 2015a, b, 2016; Shinohara & Li, 2015; Shinohara & Yoshida, 2015). In China, 136 species of the genus have been recorded (Li *et al.*, 2012, 2013a, b, c, 2014a, b, 2016a, b; Li & Wei, 2012, 2013; Liu *et al.*, 2015a, b, 2016; Taeger *et al.*, 2010; Wei *et al.*, 2006, 2013; Wu *et al.*, 2012; Zhao *et al.*, 2010; Zhao & Wei, 2011; Zhu *et al.*, 2012).

Flavomaculata-group is a middle group of *Macrophya*, including 11 species and 2 subspecies all over the world. They are *M. acuminiclypeus* Zhang & Wei, 2006 from China, *M. falsifica* Mocsáry, 1909 from Japan, *M. flavomaculata* (Cameron, 1876) from China, *M. fraxina* Zhou & Huang, 1980 from China, *M. khasiana* Saini, Bharti & Singh, 1996 from India, *M. manganensis* Saini, Bharti & Singh, 1996 from India, *M. parviserrula* Chen & Wei, 2005 from China, *M. quadriclypeata* Wei & Nie, 2002 from China, *M. satoi* Shinohara & Li, 2015 from Japan, *M. verticalis* Konow, 1898 from China, North Burma and North Vietnam (including *M. v. verticalis* Konow, 1898 from North Vietnam and *M. v. tonkinensis* Malaise, 1945 from China and North Burma) and *M. zhengi* Wei, 1997 from China (Cameron, 1876; Konow, 1898; Mocsáry, 1909; Forsius, 1925; Malaise, 1945; Zhou & Huang, 1980; Saini, Bharti & Singh, 1996; Wei, 1997; Wei & Nie, 2002; Chen *et al.*, 2005; Zhang & Wei, 2006).

So there are 6 species of this group reported in China. In this paper, another two species of this group from Gansu and Hunan Provinces in China are described as new to science, and a key to most species from China is provided.

2 Materials and methods

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The specimens were examined with a Motic-SMZ-168 steatometer. Adult images were taken with a Nikon D700 digital camera and a series of images montaged using Helicon Focus (©HeliconSoft). All images were further processed with Adobe Photoshop CS 11.0®.

Morphological descriptions of new species are based on the holotype. The terminology of genitalia follows Ross (1945) and the general morphology follows Viitasari (2002), while few terms (e.g. middle fovea and lateral fovea) follow Takeuchi (1952).

The specimens examined in this study, including all holotypes and paratypes of the new species, are deposited in the Insect Collection of Central South University of Forestry and Technology, Changsha, Hunan, China (CSCS).

3 Taxonomy

The *flavomaculata*-group

Diagnosis. Species of *flavomaculata*-group have body mostly yellow usually, without metallic tinged macula. The species group is characterized by the labrum longer than breadth, malar space shorter than the diameter of the middle ocellus; clypeus subsquared, anterior margin deep, lateral lobes acute and long; breadth of clypeus as long as the distance between lower corner of eyes, but clearly shorter than height of eyes; antennomere 1 yellow usually; dorsal side of hind tibia with yellowish-white macula usually; valvices of penis valve narrow and long usually, without ergot usually. The *flavomaculata*-group includes the known species (except *M. falsifica*, *M. fraxina*, *M. khasiana*, *M. manganensis*, *M. satoi*, *M. v. verticalis* and *M. v. tonkiensis*) can be separated by the following key.

Key to the most known species of the *flavomaculata*-group from China.

1. Hind tarsi entirely black, without other color macula absolutely 2
Hind tarsi not entirely black, with yellow maculae more or less 3
2. Female, body length 9.5 mm; clypeus broader than long clearly, anterior margin incised to approximately 1/2 length of clypeus, lateral lobes narrow and long, anterior margins obtuse; dorsum of head not shiny, frons densely punctured, interspaces between punctures distinctly narrower than the diameter of puncture; postocellar area weakly elevated, about 2 times broader than long; mesoscutellum entirely yellow; posterior margin of abdominal tergum 1 with yellow bands distinctly, lateral sides broader than middle, lateral sides of abdominal terga 2–7 with clear yellow bands, abdominal terga 8–10 with clear band lows at middle; hind tibia largely black, yellow macula on subapex in dorsal side about 1/3 times length of hind tibia. China (Jiangxi, Hunan, Fujian) *M. acuminiclypeus*
Male, body length 6 mm; clypeus sub-square, anterior margin deep and incised to approximately 3/5 length of clypeus, lateral lobes slightly long, anterior margins acute; dorsum of head less shiny, frons with some shallow and minute punctures; postocellar area distinctly elevated, about 1.5 times broader than long; mesoscutellum entirely black; posterior margin of abdominal tergum 1 with narrow yellow band, lateral sides of abdominal terga 2–5 with small yellow maculae, other terga entirely black; hind tibia entirely black, dorsal side without yellow macula absolutely. Female: unknown. Burma, India, China (Yunnan, Tibet) *M. verticalis*
3. Antennae entirely black 4
Antennae not entirely black, pedicel yellow or brown at least 5
4. Clypeus arc-shaped deeply, anterior margin incised to approximately 1/2 length of clypeus, lateral lobes subtriangular-like, anterior margins acute (Fig. 11); frons distinctly depressed (Fig. 10); mesepisternum entirely black; abdominal tergum 1 without lateral macula, lateral sides of abdominal terga 2–4 with yellowish white maculae clearly, abdominal terga 5–6 entirely black, middle parts of abdominal terga 7–10 with yellowish white maculae; basal 1/3 of hind femur yellow, apical 2/3 black; a yellowish white macula in dorsal side about 1/2 times length of hind tibia at middle (Fig. 9). China (Hunan) *M. zhui Li, Liu & Wei, sp. nov.*
Clypeus shallow, anterior margin incised to approximately 1/6 length of clypeus, lateral lobes subangular-like, anterior margins not acute; frons not depressed; mesepisternum not entirely black, center with a transverse yellow macula; lateral corners of abdominal terga 1–8 with yellow maculae clearly, middle parts of abdominal terga 8–10 with yellow maculae; basal 2/3 of hind femur yellow, apical 1/3 black; a broad yellow ring at middle and 1/2 times length of hind tibia. China (Hunan, Guizhou) *M. quadriclypeata*
5. Hind tarsi entirely yellow 6
Hind tarsi partly yellow or yellowish white, others black more or less 7
6. Scapus and basal 1/2 of pedicel yellow; postocellar area and 2 small maculae on temple yellow; center of mesepisternum with a large yellow macula; parapsis of mesonotum with 2 long triangular yellow maculae; basal 3/5 of hind femur yellow, apical 2/5 black; a yellow ring at middle and about 2/3 times length of hind tibia, others black; middle serrulae of lancet with 6 distal teeth, subbasal teeth large. China (Sichuan, Yunnan) *M. zhengi*
Scapus shortly brown (Fig. 4); postocellar area except for posterior margin and temple entirely black (Fig. 2); mesepisternum largely black, but lower part of posterior margin of mesepisternum with a small yellow macula (Fig. 5); mesonotum entirely black;

basal 1/3 of hind femur yellow, apical 2/3 black; a pale yellow ring at middle and about 1/2 times length of hind tibia, two sides yellowish brown (Fig. 1); middle serrulae of lancet with 8–9 distal teeth, subbasal teeth small (Fig. 8). China (Gansu).....

.....*M. coloritibialis* Li, Liu & Wei, sp. nov.

7. Scapus yellow ohly; Middle part of mesepisternum with 2 small yellow maculae; apical 1/3 of postocellar area with yellow maculae; outer temple entirely black; a yellow macula at middle and about 1/3 times length of hind tibia, not ring. (Male: hind tarsi entirely black). China (Sichuan).....

.....*M. parviserrula*

Scapus and pedicel yellow at least; other characters not different from the former. China (Shaanxi, Henan, Anhui, Hubei, Zhejiang, Fujian, Jiangxi, Hunan, Guizhou, Guangxi).....

.....*M. flavomaculata*

Macrophya coloritibialis Li, Liu & Wei, sp. nov. (Figs 1–8)

Female. Body length 8.0–8.5 mm. Body largely black, following parts pale yellow: palp largely, basal 1/2 of mandibles, lateral corners of pronotum with large maculae, tegula, mesoscutellum, a small macula on center of posterior margin of mesepisternum, lateral margins of abdominal terga 2–8 with long maculae, center and lateral posterior margins of abdominal tergum 10, base of every coxa, some stripes on outer side of middle coxa, an oval macula on base of outer side of hind coxa, every trochanter, base and apex of fore and middle femora, basal 2/5 of hind femur, base largely of middle tibia and middle 1/2 of hind tibia with a broad ring. Labrum largely, apical 1/3 of clypeus and legs largely yellowish-brown; all coxae except for apex with pale yellow maculae, middle of fore and middle femora with a broad ring and apical 3/5 of hind femur with black maculae. Body hairs silver, setae on sheath yellow. Wings hyaline, without smoky macula, vein C and vein Sc yellowish-brown, stigma and veins largely black brown (Fig. 1).

Dorsal head feebly shiny; frons sparsely and shallowly punctured, microsculpture fine but distinct (Fig. 2); labrum and clypeus less shiny, with some large and shallow punctures, microsculpture fine. Mesonotum not shiny, punctures on mesonotum very shallower and minuter than punctures on head, interspaces with fine microsculpture; mesoscutellum shiny, center without distinct punctures, but with fine microsculpture; mesoscutellar appendage dull, with some punctures and microsculptures. Mesopleuron feebly shiny, mesepisternum slightly densely punctured, interspaces narrow; anepimeron dull, with coarse wrinkles; anterior area of katepimeron smooth and shiny, without puncture or microsculpture, posterior area largely of katepimeron with some large and coarse punctures and microsculptures; metepisternum dull, outer side with some minute punctures; metepimeron less shiny, with some large punctures (Fig. 5). Abdominal tergum 1 less shiny, lateral sides with some shallow punctures, other area nearly smooth; other abdominal terga with minute and shallow punctures, microsculpture fine but distinct. Ventral side of hind coxa with dense and coarse punctures, less shiny; outer side of hind coxa and hind femur not densely but minutely punctured. Surface of sheath coriaceous, with indistinct punctures and fine microsculptures.

Labrum weakly elevated, anterior margin of labrum truncate; clypeus weakly elevated and subquadrate, base broader than distance between lower corner of eyes; lateral sides slightly convergent forwards, anterior margin arcuate and deeply incised to approximately 1/2 length of clypeus, lateral lobes long and narrow, lobe margin obtuse (Fig. 3); malar space 0.8 times as long as the diameter of middle ocellus; frons slightly depressed, about as high as top of eyes in lateral view; middle fovea shallow and rounded; lateral foveae slightly deep, short furrow-like; interocellar furrow distinct, postocellar furrow indistinct; POL:OOL:OCL=7:11:7; postocellar area weakly elevated, 2 times broader than long; lateral furrow slightly deep and divergent backwards; head narrowed behind eyes in dorsal view, occipital carina complete. Antenna slender, 0.9 times longer than head and thorax together, as long as abdomen; antennomere 2, 1.2 times as long as broad, antennomere 3, 1.7 times as long as antennomere 4, 0.9 times as long as antennomeres 4 and 5 together (8:9), middle antennomeres slightly inflated, subapical antennomeres weakly compressed (Fig. 4). Mesoscutellum weakly elevated, nearly flat, without middle carina or peak, with weak posterior carina, as high as top of mesonotum in lateral view; dorsal-posterior platform of mesepimeron as broad as diameter of middle ocellus; metepimeron without appendage; distance between cenchri 2 times breadth of a cenchrus; mesopleuron and metapleuron as shown in Fig. 5. Inner tibial spur of hind leg 0.5 times length of hind tarsomere 1; hind tarsomere 1 slender, as long as following 4 tarsomeres together; claw with inner tooth shorter than outer tooth. Ovipositor sheath longer than hind tarsomere 1 (7:6), apical sheath as long as basal sheath, apical margin round in lateral view (Fig. 6). Fore wing with crossvein cu-a joining cell 1M at basal 1/3, crossvein 2r joining cell 2Rs at apical 1/3, cell 2Rs slightly longer than cell 1Rs, anal cell with a long petiole, about 1.5 times longer than crossvein 1r-m; petiole of anal cell in hind wing about 3/5 times longer than crossvein cu-a. Lancet with 21 serrulae (Fig. 7), lancet slightly long and narrow, middle serrulae not protruding nearly, middle serrulae each with 1 proximal and 8–9 distal teeth, subbasal teeth small, annular spine bands narrow, 8th–10th serrulae at basal as shown in Fig. 8.

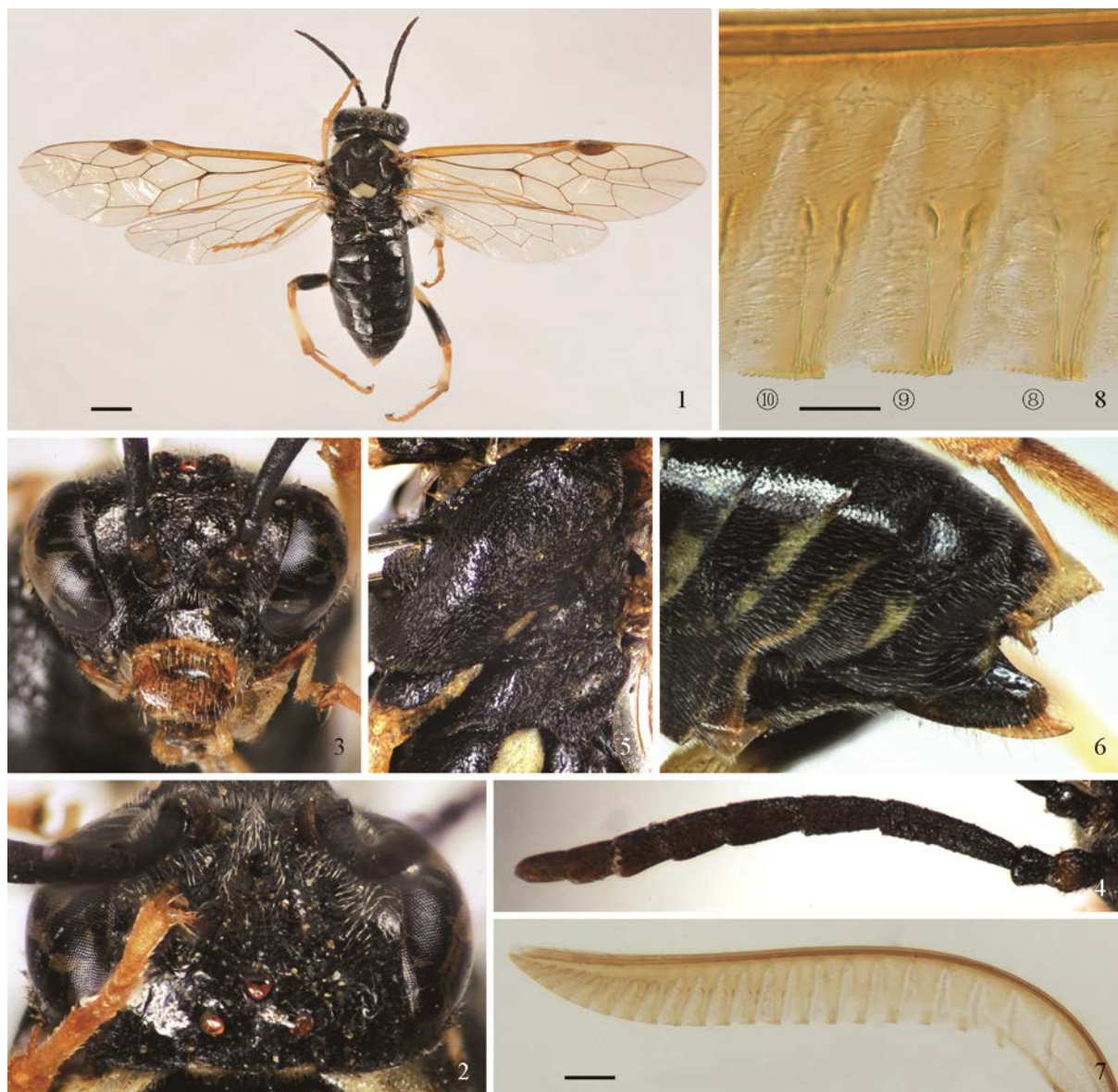
Male. Unknown.

Holotype ♀, China, Gansu, Qingyang City, Zhengning County, Zhongwan Forest Farm (35°26'N, 108°34'E; elev. 1590 m), 1 May 2009, leg. Mingjun Tang. Paratype. 1 ♀, same data as holotype.

Distribution. China (Gansu).

Etymology. The specific name is derived from two Latin words, “*color*” (colour) and “*tibialis*” (tibia), with reference to the hind tibia of the new species with different color maculae.

Remarks. The new species is similar to *M. zhengi* Wei, 1997, it is easy to be distinguished by the above key. As well as the new species is different from other species of this species group in lateral corners of pronotum with large maculae, mesoscutellum, tegula, posterior margin in lateral corners of abdominal terga 2–8 with long maculae, lateral sides and center of abdominal tergum 1 and all trochanters, pale yellow; labrum largely, apical 1/3 of clypeus and all legs largely, yellowish-brown; middle 1/2 of hind tibia with a broad and pale yellow ring.



Figures 1–8. *Macrophya coloritibialis* Li, Liu & Wei, **sp. nov.**, female, holotype. 1. Dorsal view. 2. Head, dorsal view. 3. Head, anterior view. 4. Antenna. 5. Mesopleuron and metapleuron. 6. Ovipositor sheath, lateral view. 7. Lancet. 8. Serrulae 8th–10th of lancet. Scale bars: 1 = 1 mm, 8 = 50 µm, 7 = 100 µm.

***Macrophya zhui* Li, Liu & Wei, **sp. nov.** (Figs 9–16)**

Female. Body length 10 mm. Body black; palp largely sordid brown; following parts yellowish-white: basal 1/2 of mandibles, labrum, clypeus, posterior margin of postocellar area, narrow maculae on posterior of temple, posterior margin

and lateral margin of pronotum, outer margin of tegula, a couple of long triangular maculae on bottom of prescutum of mesonotum, mesoscutellum, posttergite, lateral sides of metascutellum, posterior margin of abdominal tergum 1, transverse maculae on lateral corners of abdominal terga 2–4, center of abdominal terga 7–8 and 10, posterior margins of all sternums, basal margins of fore and middle coxae, apex and a small oval macula on base of outer side of hind coxa, all trochanters, anterior side of fore femur, base and apical margin of middle femur, basal 1/3 of hind femur, fore tibia except for some black stripes on outer side, middle tibia except for base on outer side and apex with black maculae, middle 1/2 on dorsal side of hind tibia, fore and middle tarsomere largely, base largely on dorsal side of metabasitarsus and 2–5 tarsomere of hind leg nearly entire. Body hairs silvery brown, setae on sheath pale yellowish brown. Wings hyaline, without smoky macula, stigma and veins black brown (Fig. 9).

Dorsal head strongly shiny; frons with very sparse and shallow punctures, area largely smooth; inner sides of temple with small smooth area, strongly shiny (Fig. 10); labrum and clypeus shiny, with some minute and shallow punctures, without distinct microsculpture. Pronotum and mesonotum feebly shiny, punctures on mesonotum slightly denser and minuter than punctures on head, not coarse, interspaces clear, with fine microsculpture; mesoscutellum shiny, center with some shallow punctures, without distinct microsculpture; mesoscutellar appendage dull, with some punctures and microsculptures; metascutellum feebly shiny, without distinct punctures, but microsculpture fine. Mesopleuron shiny, mesepisternum densely punctured, interspaces between punctures narrow; upper 1/2 with large punctures, lower 1/2 with minute punctures; anepimeron dull, with coarse wrinkles; anterior margin of katepimeron smooth and shiny, without puncture or microsculpture, middle depressed area of katepimeron with distinct microsculptures, posterior area of katepimeron with distinct punctures; metepisternum dull, outer side with slightly dense and minute punctures, microsculpture fine, metepimeron less shiny, depressed area with shallow punctures, microsculpture fine but distinct, dorsal margin with some coarse punctures (Fig. 13). Abdominal tergum 1 shiny, lateral sides with some shallow punctures, center nearly smooth; other abdominal terga less shiny, basal 2/3 of abdominal terga 2–5 densely and shallowly punctured, apical 1/3 sparsely punctured; abdominal terga 6–10 densely and minutely punctured, microsculpture fine but distinct. Hind coxa and outer side of hind femur with some minute punctures, interspaces between punctures indistinct, less shiny. Surface of sheath coriaceous, with indistinct punctures and fine microsculpture.

Middle of labrum elevated, anterior margin of labrum truncate; clypeus elevated, base slightly broader than distance between lower corner of eyes; lateral sides distinctly convergent forwards, anterior margin of clypeus half rounded and deeply incised to approximately 1/2 length of clypeus, lateral corners long and obtuse (Fig. 11); malar space 0.4 times as long as diameter of middle ocellus; frons weakly depressed, slightly lower than top of eyes in lateral view; middle fovea shallow and rounded; lateral foveae slightly deep, short furrow-like; interocellar furrow distinct, postocellar furrow indistinct; POL:OOL:OCL=5:12:8; postocellar area elevated, about 2 times broader than long; lateral furrow shallow and divergent backwards; head narrowed behind eyes in dorsal view, occipital carina complete. Antenna slender, 1.3 times longer than head and thorax together (13:10), 1.2 times longer than abdomen (13:11); antennomere 2 as long as breadth, antennomere 3, 1.4 times as long as antennomere 4 (10:7), 0.8 times as long as antennomeres 4 and 5 together (3:4), middle antennomeres slightly inflated, subapical antennomeres weakly compressed (Fig. 12). Mesoscutellum roundly elevated, without carina or peak, as high as top of mesonotum in lateral view; metascutellum with lower middle carina; dorsal-posterior platform of mesepimeron 0.8 times as broad as diameter of middle ocellus; metepimeron without appendage; distance between cenchri 2 times breadth of a cenchrus; mesopleuron and metapleuron as shown in Fig. 13. Inner tibial spur of hind leg about 0.6 times length of hind tarsomere 1 (16:25); hind tarsomere 1 slender, 1.2 times longer than following 4 tarsomeres together (25:21); claw with inner tooth shorter than outer tooth. Ovipositor sheath clearly shorter than hind tarsomere 1 (19:25), apical sheath slightly shorter than basal sheath, apical margin roundish in lateral view (Fig. 14). Fore wing with crossvein cu-a joining cell 1M at basal 1/3, crossvein 2r joining cell 2Rs at apical 1/4, cell 2Rs slightly longer than cell 1Rs, anal cell with a long petiole, 2 times longer than crossvein 1r-m; petiole of anal cell in hind wing about 1/3 times longer than crossvein cu-a. Lancet with 21 serrulae (Fig. 15), lancet slightly long and narrow, middle serrulae not protruding and each with 1–2 proximal and 4–5 distal teeth, subbasal teeth large, annular spine bands slightly broad, 8th–10th serrulae at basal as shown in Fig. 16.

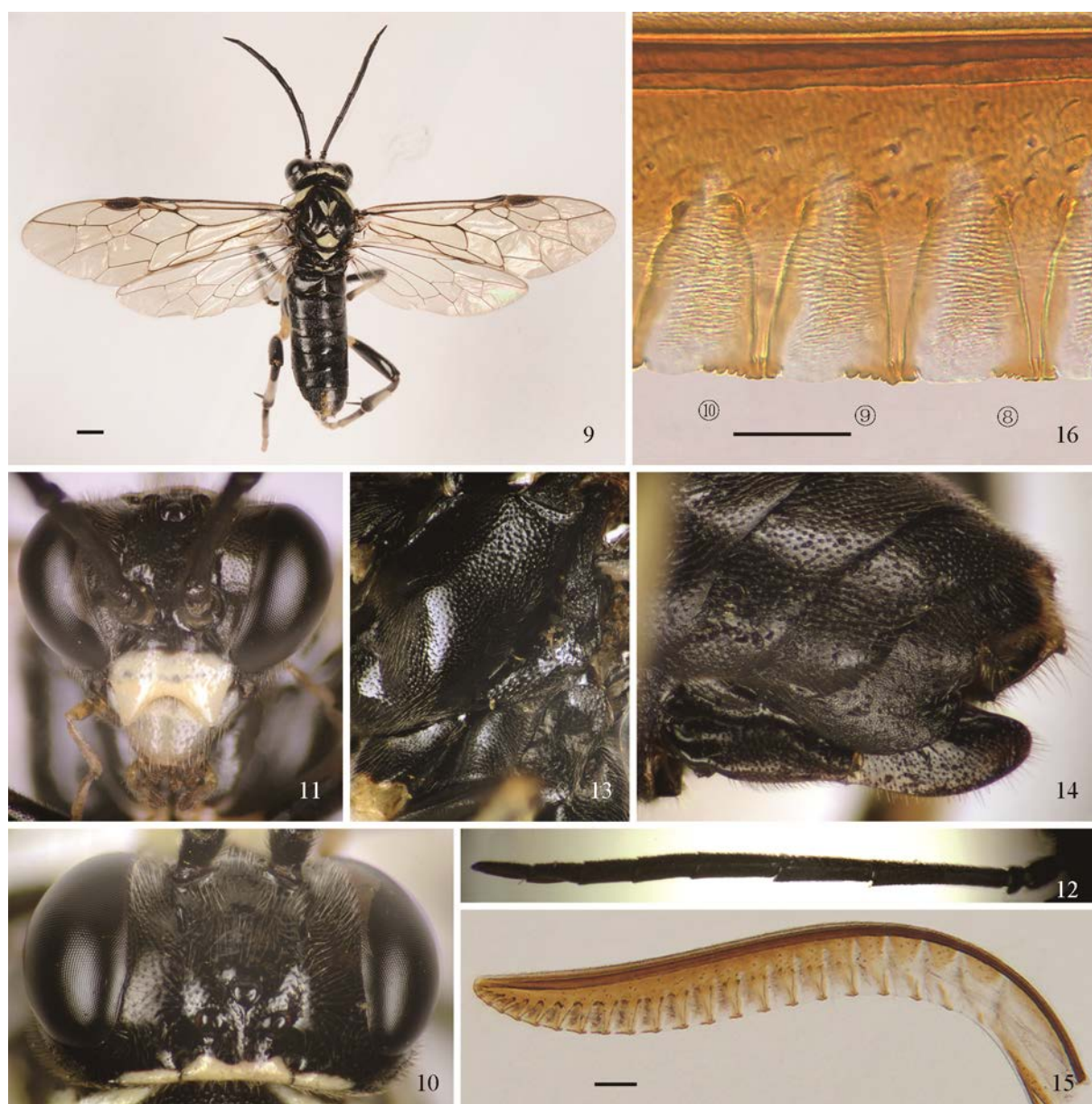
Male. Unknown.

Holotype ♀, China, Hunan, Shimen County, Mt. Huping, Shinianzigou (30°01'N, 110°33'E; elev. 710 m), 1–3 June 2011, CSCS11040, leg. Chaoyang Zhu.

Distribution. China (Hunan).

Etymology. This new species is named after Mr. Chaoyang Zhu, who collected the holotype of the new species.

Remarks. The new species is similar to *M. quadriclypeata* Wei & Nie, 2002, it can be distinguished from other species based on the above key.



Figures 9–16. *Macrophya zhui* Li, Liu & Wei, **sp. nov.**, female, holotype. 9. Dorsal view. 10. Head, dorsal view. 11. Head, anterior view. 12. Antenna. 13. Mesopleuron and metapleuron. 14. Ovipositor sheath, lateral view. 15. Lancet. 16. Serrulae 8th–10th of lancet. Scale bars: 9 = 1 mm, 16 = 50 μ m, 15 = 100 μ m.

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